

1. [Test 1](#)
2. [Internal cnxn targets](#)
3. [Using material to design and make things](#)
4. [Appendix 1: FFT Flowgraphs](#)

Test 1

this is a test of the connexions system

FIRST EUBANK CONFERENCE: MODELING REAL WORLD  
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School of Engineering Department of Statistics

**Equation:**

$$r - z_{\alpha/2} \frac{1 - r^2}{\sqrt{n}} \leq \rho \leq r + z_{\alpha/2} \frac{1 - r^2}{\sqrt{n}}$$

Internal cnxn targets

## Exercises

**Exercise:**Exercise with names

**Problem:**Named problem

How many reference librarians does it take to screw in a light bulb?

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**Solution:**Named solution

Not sure, but I can look it up.

**Exercise:**Exercise without names

**Problem:**

How many reference librarians does it take to screw in a light bulb?

---

**Solution:**

Not sure, but I can look it up.

## Rules etc.

Occam's Razor

Don't multiply entities unnecessarily.

It's in the eating.

Gudger's Theorem

Overalls worn while farming will acquire a local memory.

Doc Watson said so.

This is a rule without a name.

No name.

This is a theorem without a name.

No name.

**Computer code**

```
<xsl:template match="*"> <xsl:apply-templates
select="@*" /> <xsl:apply-templates>
</xsl:template> file = open('myfile.txt') for line
in file: print "Woof: %d" % len(line) file.close()
```

**Table entries**

I am a rather elderly man.	The nature of my avocations for the last thirty years has brought me into more than ordinary contact with what would seem an interesting and somewhat singular set of men, of whom as yet nothing that I know of has ever been	I have known very many of them, professionally and privately, and if I pleased, could relate divers histories, at which good-natured gentlemen might smile, and sentimental	But I waive the biographies of all other scriveners for a few passages in the life of Bartleby, who was a scrivener of the strangest I ever saw or heard of.
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	written:--I mean the law-copyists or scriveners.	souls might weep.	
While of other law-copyists I might write the complete life, of Bartleby nothing of that sort can be done.	I believe that no materials exist for a full and satisfactory biography of this man.	It is an irreparable loss to literature.	Bartleby was one of those beings of whom nothing is ascertainable, except from the original sources, and in his case those are very small.
What my own astonished eyes saw of Bartleby, _that_ is all I know of him, except, indeed, one vague report which will appear in the sequel.	Ere introducing the scrivener, as he first appeared to me, it is fit I make some mention of myself, my _employees_, my business, my chambers, and general surroundings; because some such description is indispensable to an adequate understanding	Imprimis: I am a man who, from his youth upwards, has been filled with a profound conviction that the easiest way of life is the best.	Hence, though I belong to a profession proverbially energetic and nervous, even to turbulence, at times, yet nothing of that sort have I ever suffered to invade my peace.

	of the chief character about to be presented.		
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## Bartleby the Scrivener

I am a rather elderly man. The nature of my avocations for the last thirty years has brought me into more than ordinary contact with what would seem an interesting and somewhat singular set of men, of whom as yet nothing that I know of has ever been written:--I mean the law-copyists or scriveners. I have known very many of them, professionally and privately, and if I pleased, could relate divers histories, at which good-natured gentlemen might smile, and sentimental souls might weep. But I waive the biographies of all other scriveners for a few passages in the life of Bartleby, who was a scrivener of the strangest I ever saw or heard of. While of other law-copyists I might write the complete life, of Bartleby nothing of that sort can be done. I believe that no materials exist for a full and satisfactory biography of this man. It is an irreparable loss to literature. Bartleby was one of those beings of whom nothing is ascertainable, except from the original sources, and in his case those are very small. What my own astonished eyes saw of Bartleby, \_that\_ is all I know of him, except, indeed, one vague report which will appear in the sequel.

Ere introducing the scrivener, as he first appeared to me, it is fit I make some mention of myself, my \_employees\_, my business, my chambers, and general surroundings; because some such description is indispensable to an adequate understanding of the chief character about to be presented.

Imprimis: I am a man who, from his youth upwards, has been filled with a profound conviction that the easiest way of life is the best. Hence, though I belong to a profession proverbially energetic and nervous, even to turbulence, at times, yet nothing of that sort have I ever suffered to invade my peace. I am one of those unambitious lawyers who never addresses a jury, or in any way draws down public applause; but in the cool tranquility of a snug retreat, do a snug business among rich men's bonds and mortgages

and title-deeds. All who know me, consider me an eminently \_safe\_ man. The late John Jacob Astor, a personage little given to poetic enthusiasm, had no hesitation in pronouncing my first grand point to be prudence; my next, method. I do not speak it in vanity, but simply record the fact, that I was not unemployed in my profession by the late John Jacob Astor; a name which, I admit, I love to repeat, for it hath a rounded and orbicular sound to it, and rings like unto bullion. I will freely add, that I was not insensible to the late John Jacob Astor's good opinion.

Using material to design and make things

## **NATURAL SCIENCES**

### **Grade 4**

## **MATTER, SUBSTANCES AND MATERIALS**

### **Module 51**

## **USING MATERIAL TO DESIGN AND MAKE THINGS**

### **Activity:**

**To investigate how we can use material to design and make wonderful things**

### **[LO 1.1.1]**

Have a good look at the pictures in the frames and complete the labels.





### MatterUseDrawing of the useTask

Cut out three pictures of different advertised products. Discuss in your groups what materials were possibly used to make these products.

Put all the pictures together, grouping them according to the material they have been made of.

## **Assessment**

### **LEARNING OUTCOME 1: SCIENTIFIC INVESTIGATIONS**

The learner will be able to act confidently on curiosity about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.

Assessment Standard

We know this when the learner

plans investigations:

- suggests actions to try with the materials.

## **Memorandum**

Learners can use either the pictures in the block, their own or a combination of both.

advertisements

- Collect advertisements regularly, watch magazines, newspapers and junk mail. Have the learners bring these to school.

## Appendix 1: FFT Flowgraphs

Flowgraphs of various radix-2 and 4 Cooley Tukey FFTs and Split Radix FFTs.

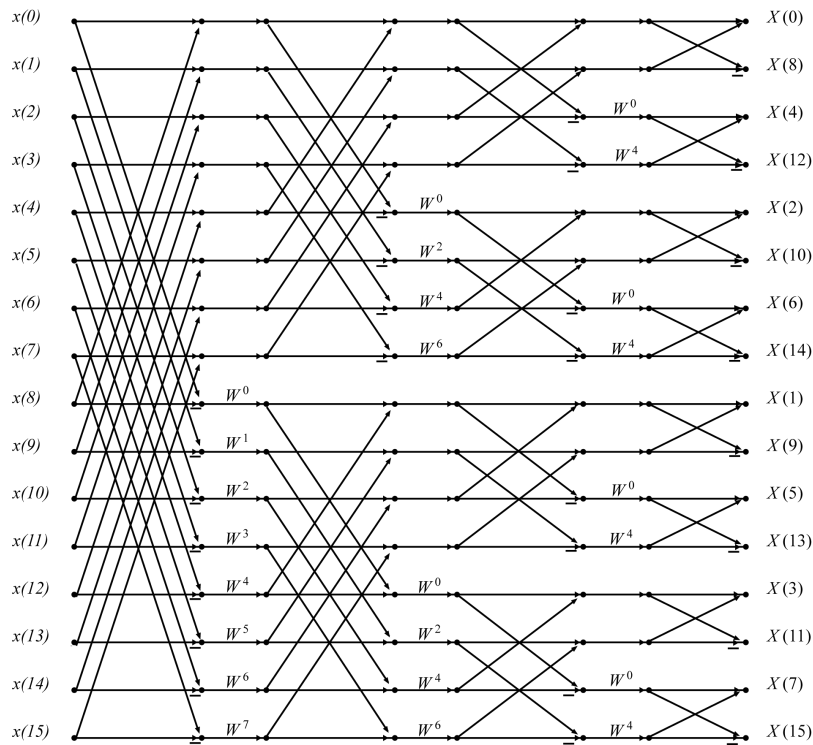
### Signal Flow Graphs of Cooley-Tukey FFTs

The following four figures are flow graphs for Radix-2 Cooley-Tukey FFTs. The first is a length-16, decimation-in-frequency Radix-2 FFT with the input data in order and output data scrambled. The first stage has 8 length-2 "butterflies" (which overlap in the figure) followed by 8 multiplications by powers of  $W$  which are called "twiddle factors". The second stage has 2 length-8 FFTs which are each calculated by 4 butterflies followed by 4 multiplies. The third stage has 4 length-4 FFTs, each calculated by 2 butterflies followed by 2 multiplies and the last stage is simply 8 butterflies followed by trivial multiplies by one. This flow graph should be compared with the index map in [Polynomial Description of Signals](#), the polynomial decomposition in [The DFT as Convolution or Filtering](#), and the program in [Appendix 3](#). In the program, the butterflies and twiddle factor multiplications are done together in the inner most loop. The outer most loop indexes through the stages. If the length of the FFT is a power of two, the number of stages is that power ( $\log N$ ).

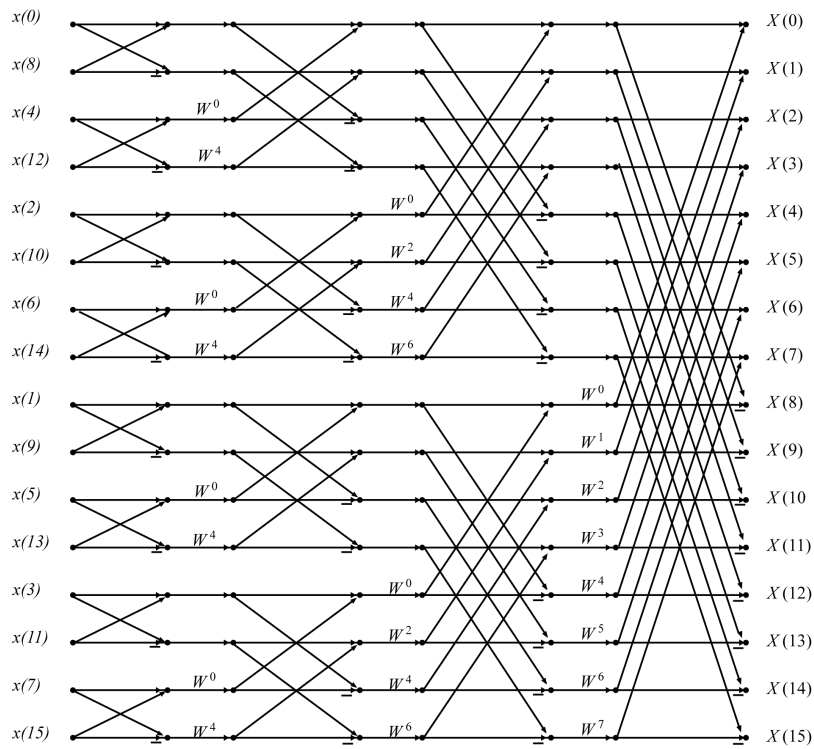
The second figure below is a length-16, decimation-in-time FFT with the input data scrambled and output data in order. The first stage has 8 length-2 "butterflies" followed by 8 twiddle factors multiplications. The second stage has 4 length-4 FFTs which are each calculated by 2 butterflies followed by 2 multiplies. The third stage has 2 length-8 FFTs, each calculated by 4 butterflies followed by 8 multiplies and the last stage is simply 8 length-2 butterflies. This flow graph should be compared with the index map in [Polynomial Description of Signals](#), the polynomial decomposition in [The DFT as Convolution or Filtering](#), and the program in [Appendix 3](#). Here, the FFT must be preceded by a scrambler.

The third and fourth figures below are a length-16 decimation-in-frequency and a decimation-in-time but, in contrast to the figures above, the DIF has the output in order which requires a scrambled input and the DIT has the input in order which requires the output be unscrambled. Compare with the

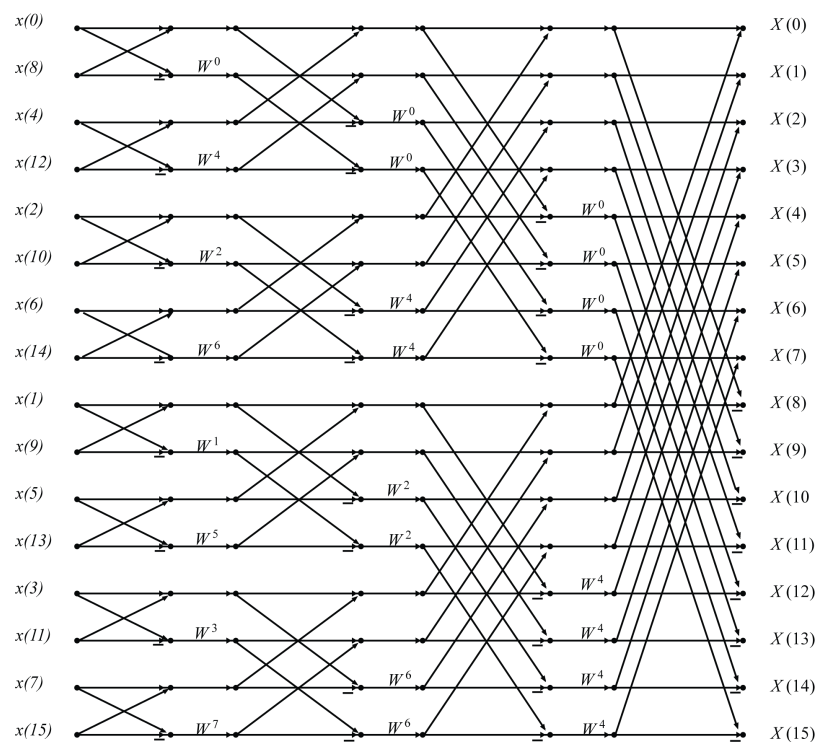
first two figures. Note the order of the twiddle factors. The number of additions and multiplications in all four flow graphs is the same and the structure of the three-loop program which executes the flow graph is the same.



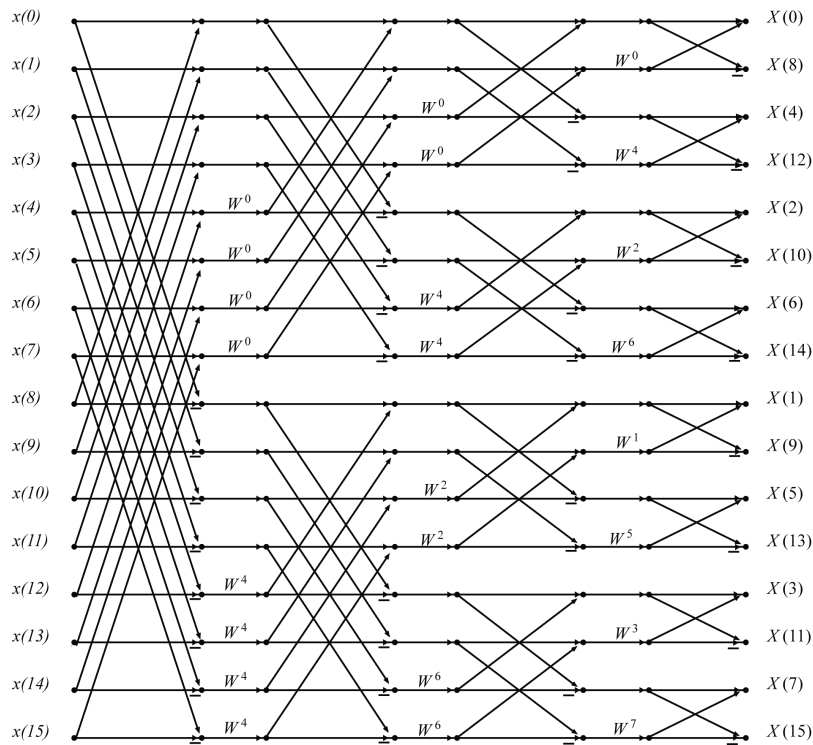
Length-16, Decimation-in-Frequency, In-order input, Radix-2 FFT



Length-16, Decimation-in-Time, In-order  
output, Radix-2 FFT

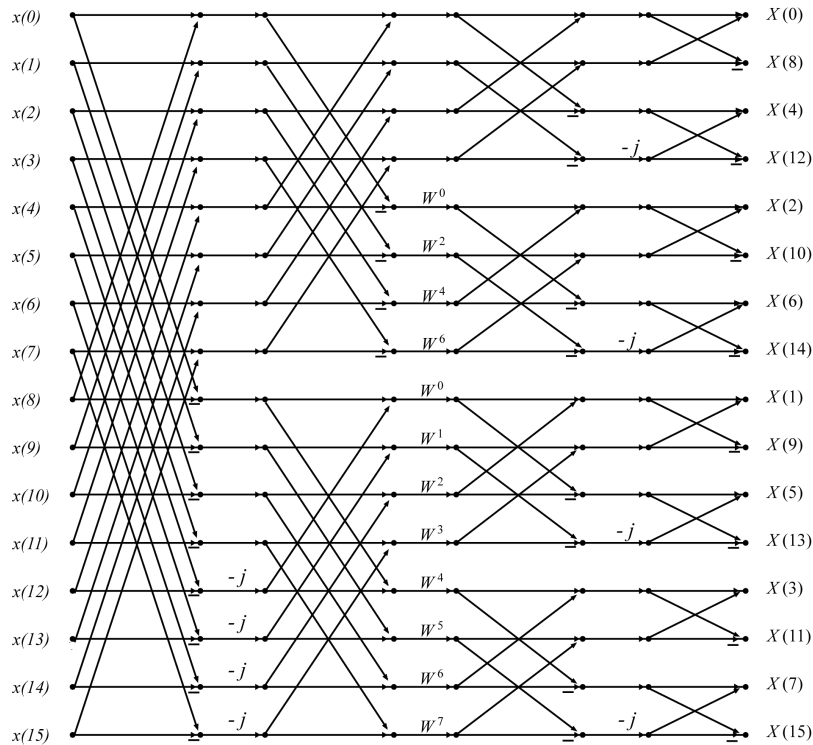


Length-16, alternate Decimation-in-Frequency, In-order output, Radix-2 FFT



Length-16, alternate Decimation-in-Time,  
In-order input, Radix-2 FFT

The following is a length-16, decimation-in-frequency Radix-4 FFT with the input data in order and output data scrambled. There are two stages with the first stage having 4 length-4 "butterflies" followed by 12 multiplications by powers of  $W$  which are called "twiddle factors". The second stage has 4 length-4 FFTs which are each calculated by 4 butterflies followed by 4 multiplies. Note, each stage here looks like two stages but it is one and there is only one place where twiddle factor multiplications appear. This flow graph should be compared with the index map in [Polynomial Description of Signals](#), the polynomial decomposition in [The DFT as Convolution or Filtering](#), and the program in [Appendix 3](#). Log to the base 4 of 16 is 2. The total number of twiddle factor multiplication here is 12 compared to 24 for the radix-2. The unscrambler is a base-four reverse order counter rather than a bit reverse counter, however, a modification of the radix four butterflies will allow a bit reverse counter to be used with the radix-4 FFT as with the radix-2.



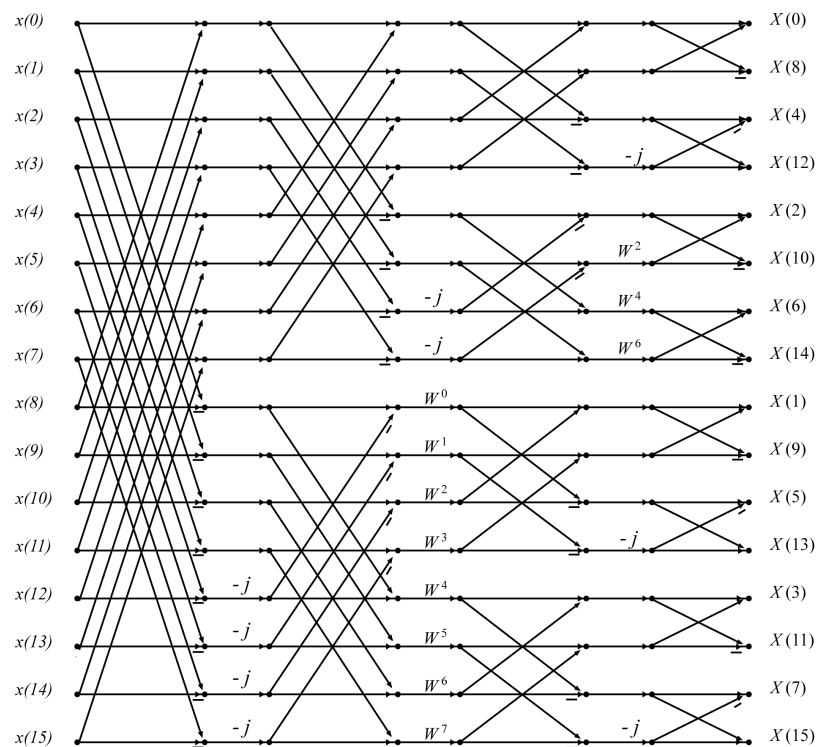
Length-16, Decimation-in-Frequency, In-order input, Radix-4 FFT

The following two flowgraphs are length-16, decimation-in-frequency Split Radix FFTs with the input data in order and output data scrambled. Because the "butterflies" are L shaped, the stages do not progress uniformly like the Radix-2 or 4. These two figures are the same with the first drawn in a way to compare with the Radix-2 and 4, and the second to illustrate the L shaped butterflies. These flow graphs should be compared with the index map in [Polynomial Description of Signals](#) and the program in [Appendix 3](#). Because of the non-uniform stages, the program indexing is more complicated. Although the number of twiddle factor multiplications is 12 as was the radix-4 case, for longer lengths, the split-radix has slightly fewer multiplications than the radix-4.

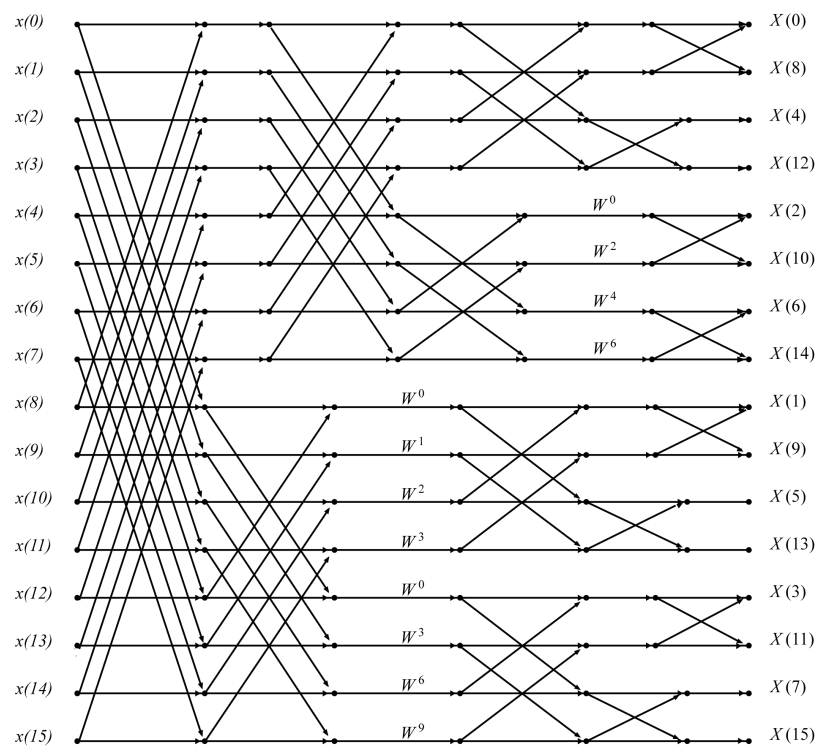
Because the structures of the radix-2, radix-4, and split-radix FFTs are the same, the number of data additions is same for all of them. However, each complex twiddle factor multiplication requires two real additions (and four



real multiplications) the number of additions will be fewer for the structures with fewer multiplications.



Length-16, Decimation-in-Frequency, In-order input, Split-Radix FFT



Length-16, Decimation-in-Frequency, Split-Radix with special BFs FFT